Conceiving M-Learning Application: A Step towards a Interactive Omnipresence Environment in Android based mobile

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ABSTRACT: *Mobile devices have become one of the most used items in our daily activities. Students can organize their study material using their mobile phones in which our Mobile learning (M-Learning) application is installed. An omnipresence learning environment is any scenery like pervasive communication in which students can become utterly engrossed in the learning process. Current E-Learning systems were based on unincorporated software application or through websites and deficient to provide an inclusive omnipresence learning environment. The main objective of the work is to develop a collaborative mobile learning application based on internet services in android based mobile devices to provide the omnipresence learning environment. This paper deals with the archetype development of an M-Learning application for mobile phones running with android platform using internet services.*

Keywords - *Android OS, E-Learning Internet, M-learning Application, Omnipresence Learning Environment, Services*

I. INTRODUCTION

Today the classroom is not the only space where learners can learn, mobile devices enable the possibility of learning anywhere and anytime. An omnipresence learning environment based on early days mobile phones deficient for communication, low data transfer speeds and capacity. M-Learning application framework enables the learner to access the learning contents and interact with the instructor and can communicate from his mobile phone during travelling or from his laptop when at home. Mobile learning used as studying application for the students. With the increased features of mobile devices, these devices have become very appealing to the students. M-Learning takes advantage of the popularity of these devices between students and instructor; it transforms students learning from something that they need to do, into something that they like to do. Current web based M-Learning systems are focused on meeting the needs of the institution in providing a basic, common educational platform. Most of universities worldwide have successfully integrated the use of an M-Learning System where all the academic information services, online contents and learning application are centralized and managed. M-Learning systems are a consolidated online learning environment already adopted by learners, teachers and institutions.

II. M-LEARNING APPLICATION

M-Learning is an emerging concept as the development of an adoption rate of mobile technologies increase rapidly on a global scale. While there are as many people using mobile technologies as there are opinions on how mobile technologies will impact E-Learning, the majority agrees that M-Learning will play a major role in E-Learning. M-Learning is a natural extension of E-Learning. It has the potential to further expand where, how, and when we learn and perform in all the aspects of our life. One of the key benefits of M-Learning is its potential for increasing productivity by making learning available anywhere and anytime, allowing learners to participate in educational activities without the restrictions of time and place.

The role that communication and interaction plays in the learning process is a critical success factor in contemporary educational paradigms. It is within this context that E-Learning and especially M-Learning can and should contribute to the quality of education. M-Learning offers opportunities for the optimizing of interaction and communication between lecturers and learners, among learners and members of COPs (communities of practice). M-Learning thrives within the contemporary social constructivist paradigm because of its richness in terms of communication and interaction, both synchronous and asynchronous.

The roles of different users in the M-Learning applications designed for ubiquitous learning environment based on the Web Services architecture discussed as follows.

The roles of an Instructor in the M-Learning are to
➢ Design and develop the content for a course

➤ Prepare tests, Quizzes and assignments for students/learners evaluation
➤ Assess the tests, assignments and projects submitted by the students/learners
➤ Send Feedback on the assignments and projects submitted by the students/learners
➤ Interacting with students/learners using communication tool provided in the learning management system.

The roles of the Learner in the M-Learning are to
➤ Take the course
➤ Take Tests on the learnt content
➤ Work on Assignments and Projects related to the course
➤ Send Feedback and Queries Related to the course
➤ Interact with the trainer and fellow learner/student concerned with the course

The roles of the Application Developer in the M-Learning are to
➤ Develop a framework where the content designed by the trainer can be presented in a pre-formatted
➤ manner to the learner when they launch the application
➤ Provide Pre-defined templates for framing the tests and assignments
➤ Design the Pervasive User Interfaces for accessing the content and tests related to that course
➤ Provide the communication platform for trainer – learner interaction messaging from the application itself

Android Platform provides the necessary tools and packages for designing the desired M-Learning application for mobile devices in the o-learning environment.

III. OMIPRESENCE LEARNING ENVIRONMENT (OLE) FOR M-LEARNING APPLICATION

Each application developed has their own implementation strategies and specific features in terms of user interface, targeted mobile devices and interoperability features. The mobile application development depends mainly on these characteristics and influenced by their underlying platform for running these applications. A mobile learning system requires an M-Learning device, an M-Learning application and M-Learning content. The M-Learning application framework helps to run diverse M-Learning content. The M-Learning content may be of simple text type to complex multi-media content with image, audio and video file formats. The M-Learning application that runs on mobile device may be a dedicated stand-alone application, a client – server model or mobile Web browser based application.

Android Inc. in its initial form was founded in Paulo Alto, California, the USA by Andy Rubin, Nick Sears, Chris White and Rich Miner in October 2003.Till the Google's purchase in August 2005, Android had passed the way from a film making company to a digital construction. So, as it was mentioned, in August 2005 Google bought Android Inc., probably making one of the great investments in the history. Android is an open-source mobile operating system and application framework for recent addition in the mobile application platform. By providing an open development platform, Android offers developers the ability to build extremely rich and innovative applications with a rich set of User Interfaces, support for broad range audio and video file formats.

IV. THE EMERGING CONCEPT M-LEARNING

Due to the enormous growth and development of the Internet over the past decades and the experimental use of the WWW and e-mail in education, eLearning emerged as an educational concept during the 1990s and has grown into a globally accepted, even necessary mode of delivery in most educational institutions. Web-based Learning Management Systems such as Blackboard and others are already widely used across the globe.

Further Internet developments over the past decade brought about a greater need for wireless connections and the development thereof. Wireless communication received enormous boosts when mobile phones reached the market. By 2000, landline telephones and also wired computers were beginning to be replaced by wireless technologies. The whole world was literally going mobile as the turn of the millennium approached. Apart from mobile phones, other wireless and mobile computational devices such as Laptops, Palmtops, PDAs (Personal Digital Assistants) and Tablets also rapidly entered the market – some devices of course with more success than others for particular markets.

V. M-LEARNING VERSUS E-LEARNING

Over the past decade we have become familiar with the term E-Learning and now M-Learning is emerging. So what is the relation between M-Learning and E-Learning?

The following comprehensive definition of Urdan and Weggen (2000:8) provides a sufficient basis to distinguish between M-Learning and E-Learning: "The term E-Learning covers a wide set of applications and processes, including computer based learning, web-based learning, virtual classrooms and digital collaboration. We define E-Learning as delivery of content via electronic media, including the internet, intranet, satellite broadcasts, audio/video tape, interactive TV and CD-ROM. Yet, E-Learning is defined more narrowly then distance learning, which would include text-based learning and courses conducted via written correspondence". So, where does M-Learning fit into the picture?

M-Learning is subset of E-Learning. E-Learning is macro concept that includes online and mobile learning environments. In this regard the following simple definition of Quin (2001:1 of 4) is very useful: "M-Learning is E-Learning through mobile computational devices: Android phones, Palms, Windows CE machines, even your digital cell phone."
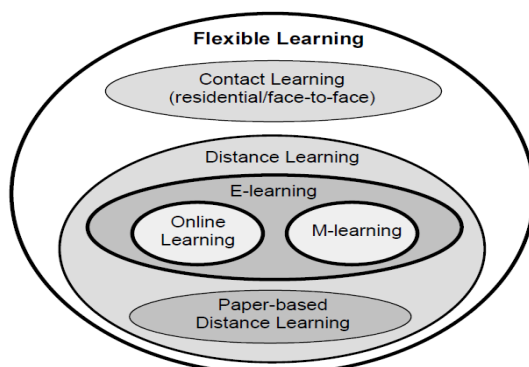
Fig. 5.1: The subsets of flexible learning

To get even a better picture, below figure visually portrays the relation between classroom environment, M-Learning and E-Learning. Please note that although the diagram illustrates the subsets of flexible learning as distinct delivery modes, these delivery modes are in practice very much integrated or blended.

From E-Learning to M-Learning

	Classroom	E-Learning	M-Learning
Access	Limited	24/7	24/7
Quality	Varied	Consistent	Consistent, Progressive
Metrics	Difficult	Difficult	Formal and Informal, Automatic, Anytime
Retention	Varied	Varied	High Retention, Personalized Learning.
Relative Cost	High	High	Currently Mid-Range, Decreasing.

Table 5.1: The various factors between different environments

VI. ARCHITECTURE

The omnipresence M-Learning Architecture is depicted in the figure 3. The three main factors in this design are the 'where', 'what' and the 'how'. The 'where' is the learning environment which signifies the anytime, anywhere learning be in the traditional classroom setting or outside the classroom like travelling in a bus or being at home and uses a wireless network with both 3G and Wi-Fi to connect with the University server at all time using Web Services architecture. The 'what' is the inclusion of pedagogical information which is based on constructivist theory, allowing students to create knowledge from what they see hear, read and perceive. The 'how' denotes an interactive learning application framework which have both client module running on mobile devices with different form factor suitable for varying learning environments like Tablet PCs for classroom learning.
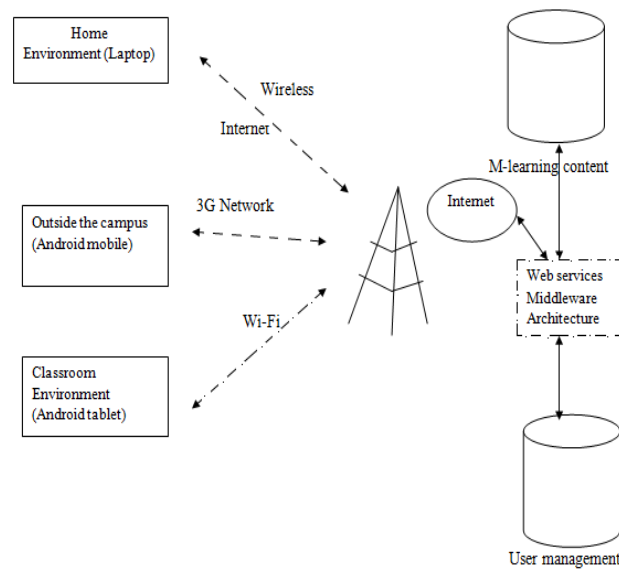
Fig. 6.1: M-Learning application for an omnipresence environment
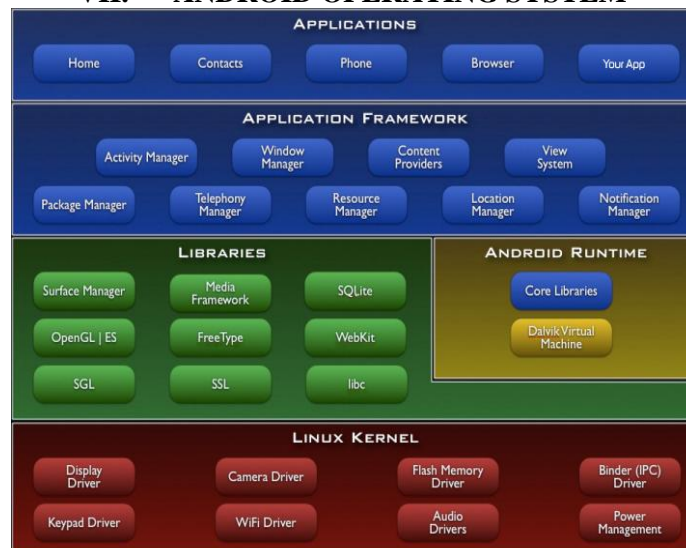
VII.   ANDROID OPERATING SYSTEM

Fig. 7.1: Android Architecture

The above figure shows the diagram of Android Architecture. The Android OS can be referred to as a software stack of different layers, where each layer is a group of several program components. Together it includes operating system, middleware and important applications. Each layer in the architecture provides different services to the layer just above it. We will examine the features of each layer in detail.

7.1   Linux Kernel

The basic layer is the Linux kernel. The whole Android OS is built on top of the Linux 2.6 Kernel with some further architectural changes made by Google. It is this Linux that interacts with the hardware and contains all the essential hardware drivers. Drivers are programs that control and communicate with the hardware. For example, consider the Bluetooth function. All devices have Bluetooth hardware in it. Therefore the kernel must include a Bluetooth driver to communicate with the Bluetooth hardware. The Linux kernel also acts as an abstraction layer between the hardware and other software layers. Android uses the Linux for all its core functionality such as Memory management, process management, networking, security settings etc. As the Android is built on a most popular and proven foundation, it made the porting of Android to variety of hardware, a relatively painless task.

7.2 Libraries

The next layer is the Android's native libraries. It is this layer that enables the device to handle different types of data. These libraries are written in c or c++ language and are specific for a particular hardware.

Some of the important native libraries include the following:

➢ Surface Manager: It is used for compositing window manager with off-screen buffering. Off-screen buffering means you can't directly draw into the screen, but your drawings go to the off-screen buffer. There it is combined with other drawings and form the final screen the user will see. This off screen buffer is the reason behind the transparency of windows.

➢ Media framework: Media framework provides different media codecs allowing the recording and playback of different media formats.

➢ SQLite: SQLite is the database engine used in android for data storage purposes.

➢ WebKit: It is the browser engine used to display HTML content.

➢ OpenGL: Used to render 2D or 3D graphics content to the screen.

7.3 Android Runtime

Android Runtime consists of Dalvik Virtual machine and Core Java libraries.

➢ Dalvik Virtual Machine: It is a type of JVM used in android devices to run apps and is optimized for low processing power and low memory environments. Unlike the JVM, the Dalvik Virtual Machine doesn't run .class files, instead it runs .dex files. .dex files are built from .class file at the time of compilation and provide higher efficiency in low resource environments. The Dalvik VM allows multiple instance of Virtual machine to be created simultaneously providing security, isolation, memory management and threading support. It is developed by Dan Bornstein of Google.

➢ Core Java Libraries: These are different from Java SE and Java ME libraries. However these libraries provide most of the functionalities defined in the Java SE libraries.

7.4 Application Framework

These are the blocks that our application directly interacts with. These programs manage the basic functions of phone like resource management, voice call management etc. As a developer, you just consider these are some basic tools with which we are building our applications.

Important blocks of Application framework are:

➢ Activity Manager: Manages the activity life cycle of applications.

➢ Content Providers: Manage the data sharing between applications.

➢ Telephony Manager: Manages all voice calls. We use telephony manager if we want to access voice calls in our application.

➢ Location Manager: Location management, using GPS or cell tower.

➢ Resource Manager: Manage the various types of resources we use in our Application.

7.5 Applications

Applications are the top layer in the Android architecture and this is where our applications are gonna fit. Several standard applications come pre-installed with every device, such as:

➢ SMS client app
➢ Dialer
➢ Web browser
➢ Contact manager

As a developer we are able to write an app which replaces any existing system app. That is, you are not limited in accessing any particular feature. You are practically limitless and can whatever you want to do with the android (as long as the user of your app permits it). Thus Android is opening endless opportunities to the developer.

VIII. THE ARCHETYPE OF M-LEARNING APPLICATION

The archetype of M-Learning application developed consists of three activities:

➢ Module Selection.
➢ Course Selection.
➢ Quiz Question & Answer Choices.
➢ Chat.
➢ Notice.
➢ Feedback.
➢ Assignments.

User logs in to the application environment then user is authenticated by the omnipresence learning server. Upon logging to the application the user profile is synced with the type of device that he uses. After successful login the main screen for module selection is presented in Figure 5. The associated activity is MLEARNINIG and is declared in Androidmanifest.xml configuration file. The main screen shows the list of choices for the learner to choose his learning activity like Notice Selection, Quiz Selection or Assignment selection. The list of courses shown in GridView type as shown in **Figure 6.**
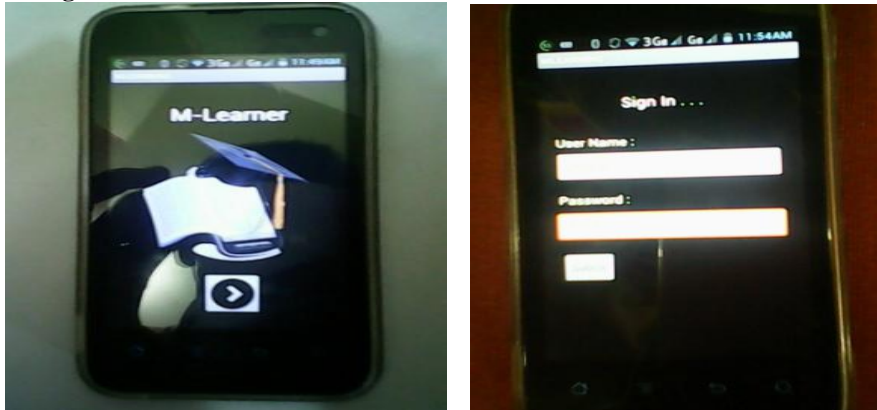
Fig. 8.1: Module Selection Screen displayed on an Android Device.

When the user chooses the appropriate choice the next screen based on another activity is launched. In this case the user has chosen the Course List and the following Activity is launched.

For example when we select the notice option, the notices which are added to server side by instructor are displayed on Android devices as shown in figure 7.1 and 7.2.Same format follows all other activities i.e. quiz, chat, feedback, assignments etc.
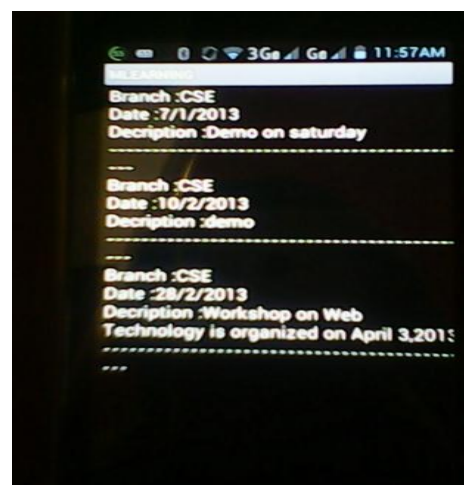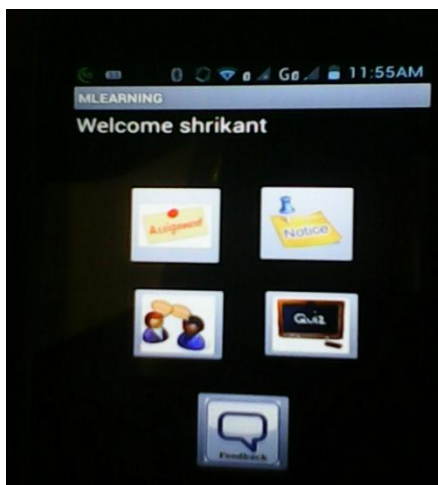
Fig. 8.2: Screen Shows   Fig 8.3: Notice

Screen different courses   shown displayed on on an Android device.
An Andriod device added by Instructor at server side.
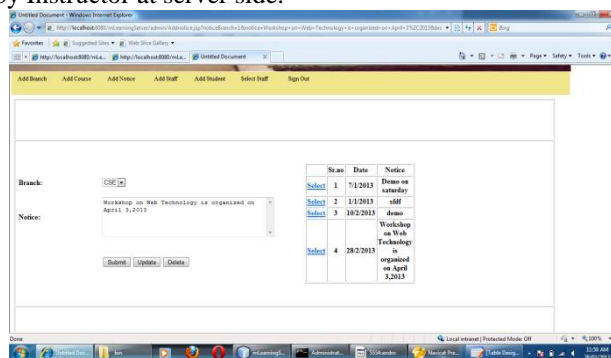
Fig. 8.4: Notice added by instructor at server side

IX. THE BENEFITS AND FUTURE OF M-LEARNING

The primary uses of ICTs (Information and communications technology) in education is quite obvious, namely access, support and communication. And this certainly applies exactly for the subset of mobile technologies. When it comes to access and support, M-Learning makes learning available anywhere, anytime. M-Learning thrives within the contemporary social constructivist paradigm because of its richness in terms of communication and interaction, both synchronous and asynchronous. Kristiansen (2001:11) acknowledges this as follows: "I see potential related to communication in terms, collaboration and problem solving through discussion with others at a distance."

Mobile technologies enrich learning possibilities even more and take it further. Kossen (2001:2of5) argues as follows: "Because mobile devices have the power to make learning even more widely available and accessible, mobile devices are a natural extension of E-Learning. Imagine the power of learning that is truly 'just-in-time', where you could actually access training at the precise place and time on the job (go) that you need it". M-Learning provides more mobility, flexibility and convenience than online learning. Life-long learning demands learn while you earn which is possible through E-Learning. M-Learning takes it further and makes it possible to learn while you earn on-the-go.

Another benefit of M-Learning is mobile devices have certain capabilities that can be delivered with greater ease than other electronic devices.

X. CONCLUSION

M-Learning has already started to play a very important role in E-Learning in all countries.M-Learning is the gateway to E-Learning for most countries as the rapidly growing wireless infrastructure fulfils the access needs more and more. The role of M-Learning in the future of E-Learning in any country should not be underestimated.

M-Learning environment is a reality that will continue to grow in form, stature and importance. It will become the learning environment of choice. As educationists, we should embrace the rich learning enhancing possibilities that M-Learning already provides and will provide even more so in future. M-Learning environments are ideal for contemporary social constructivist approaches where interaction and communication between lecturers and learners, among learners and members of COPs. M-Learning also fulfils the growing demands for life-long learning opportunities that enable you to learn while learn while you earn on the go.

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